

# HISTORY OF MAJOR AMENDMENTS TO BUILDING STANDARD LAW AND TYPICAL CONFLICTS OF EXISTING NON-CONFORMED BUILDINGS IN JAPAN

---

Senior Researcher

Jun-ichi Suzuki

Building department, Fire standards division,  
National Institute for Land and Infrastructure Management  
(NILIM), 2016.5

# Contents

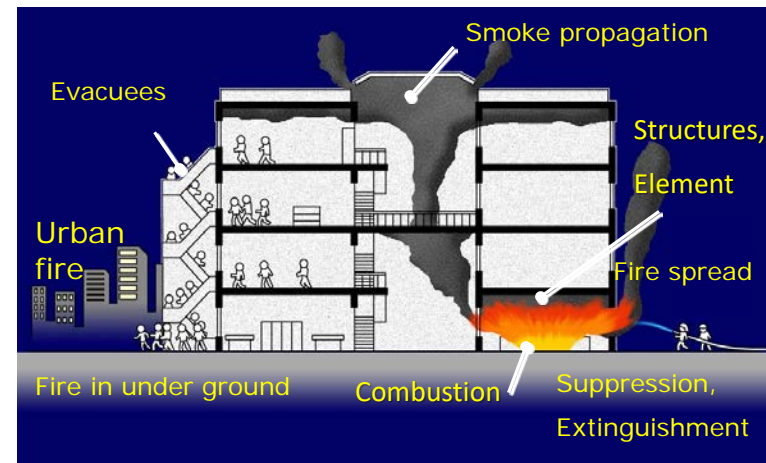
- History of major amendments to fire safety regulations
  - Outline of the Building Standard Law(BSL) and the Fire Services Law (FSL) of Japan
  - Major amendments
- Typical conflicts of existing buildings
  - A survey of existing office buildings on fire safety issues
- Case studies of evaluation in fire for existing buildings by a performance-based method
- Ongoing projects for fire safety of existing buildings

# Outline of the Laws for fire safety of buildings

- **Building Standard Law (BSL)**

Ministry of Land, Infrastructure and Tourism(MLIT)

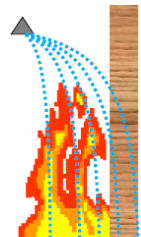
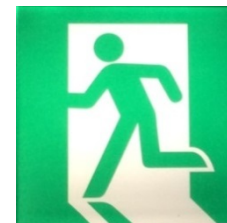
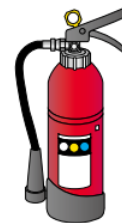
- Regulations of **buildings and equipment (Lifts, plumbing, etc.)**:
- **Material** : Fire preventive materials
- **Structure**: Fire resistance of building elements, Fire compartment
- **Evacuation**: Evacuation route  
Smoke and Fire compartment



- **Fire Services Law (FSL)**

Fire and Disaster Management Agency (FDMA), Ministry of internal affairs and communications

- Regulations of **fire protection equipment** and fire service activity :
- Fire extinguisher
- Suppression system
- Alarm system
- Emergency exit (such as evacuation ladders)
- Guidance system(Emergency exit sign)
- Water source, reservoir tanks
- Facilities for fire service activities (heat and smoke exhaust system, standpipe, etc.)



# Outline of the Laws for fire safety of buildings

- **Application of BSL amendments to existing buildings**  
(Non-retroactivity principle is based on the Constitution)
- The BSL has **relaxations** for existing buildings.
  - Requirements by an amendment **do not apply** to existing buildings, building under construction that had conformed old codes at that time.  
If large-extension, large-scale repair, renovation, or reconstruction (extension etc.) of the buildings is **not conducted after an amendment**.
  - The latest codes are applied to the whole building when extension etc. is conducted.
  - A building with conflicts are named "**Existing non-conformed building**", and distinguished with "illegal building".

# Outline of the Laws for fire safety of buildings

- Application of FSL amendments to existing buildings
- Retroactivity in FSL
  - Specified fire-prevention objects[buildings and structures]\* have to follow an amendment to all fire protection equipment.



Example of fire protection equipment: Fire hydrant, suppression system (sprinkler) etc. (relatively high cost)

- ALL existing buildings except single dwellings have to follow a new amendment to part of fire protection equipment :

Fire extinguisher, emergency exit sign lighting etc.  
(relatively low cost)



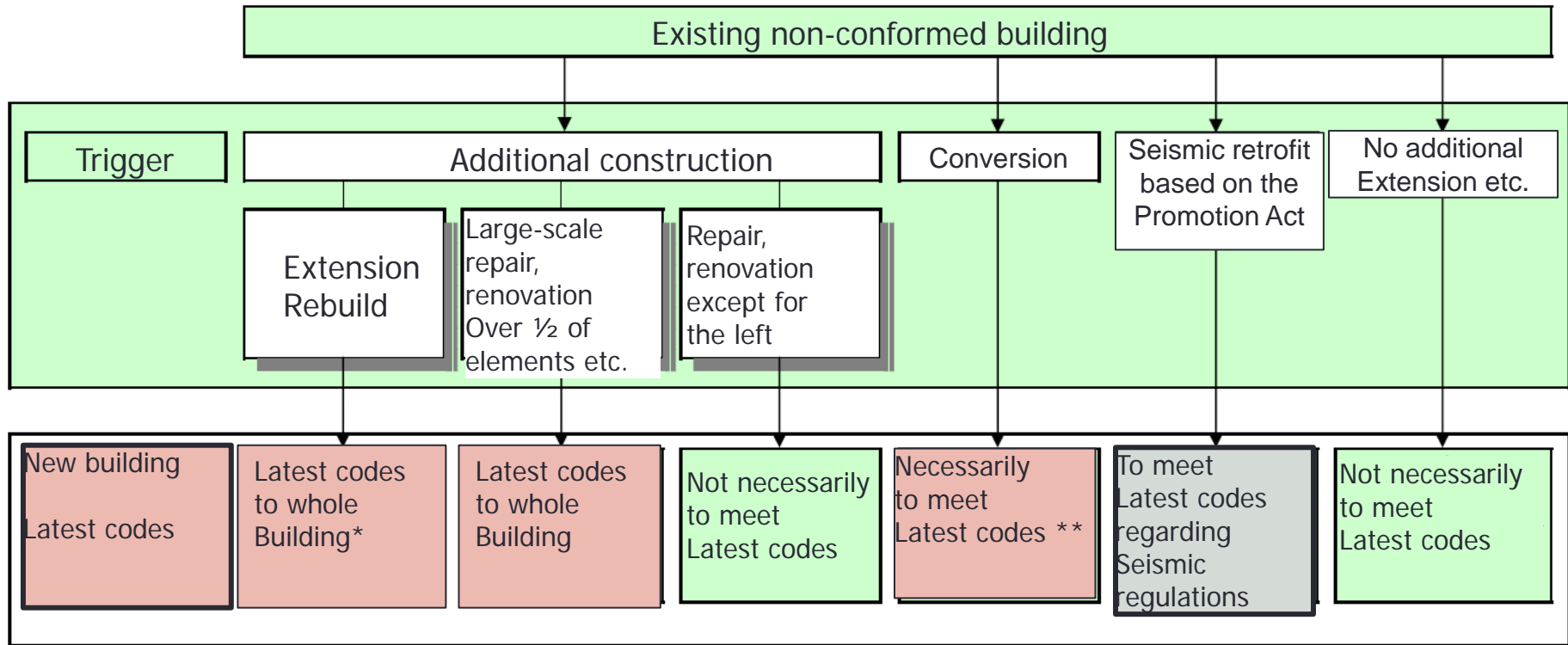
- Fire alarm is required in bed room in single dwellings



\* Specified fire-prevention buildings and structures:

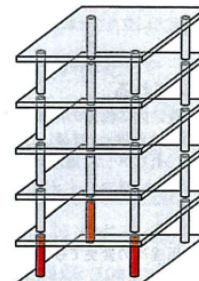
Occupancy type : department store, hospital, night club, hotel, theater, underground shopping district etc., in which heavy casualties would be incurred in case of a fire

# Triggers of retroactivity of existing buildings

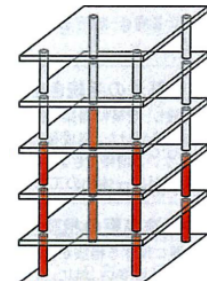


\*: Very small scale extension etc. (less than 10m<sup>2</sup>) are exceptions.

\*\*: if occupation of the conversion is similar to the previous occupation, it is not necessary to meet latest codes.



Not large-scale



Large-scale

Over 1/2 of principal elements

Repair, renovation

# History of fire incidents and major amendment of BSL and FSL (fire safety)

Years	Major fire incidents	BSL	FSL
1948			Established
1950		Established	
1953-1959	Theaters	✓	
1961-	Department stores	✓	✓
1966-1969	Hotel (Japanese style)	✓	✓
1970-1974	Huge fires in Department stores, etc.	✓	✓
1975-1979	Multitenant building	✓	✓
1980-1986	Underground shopping district, hotels	✓	✓
1987	Social welfare facilities	✓	✓
1989	A condominium		
1990-1997	Department store	✓	✓
1998-2000		✓ PBC	✓
2001-2002	Multitenant building		✓ PBC
2006-2010	Care houses		✓
2013-2015	A clinic, Multitenant building	✓ ✓	

✓ : relaxation    ✓ : restriction    ✓ : Performance Based Code

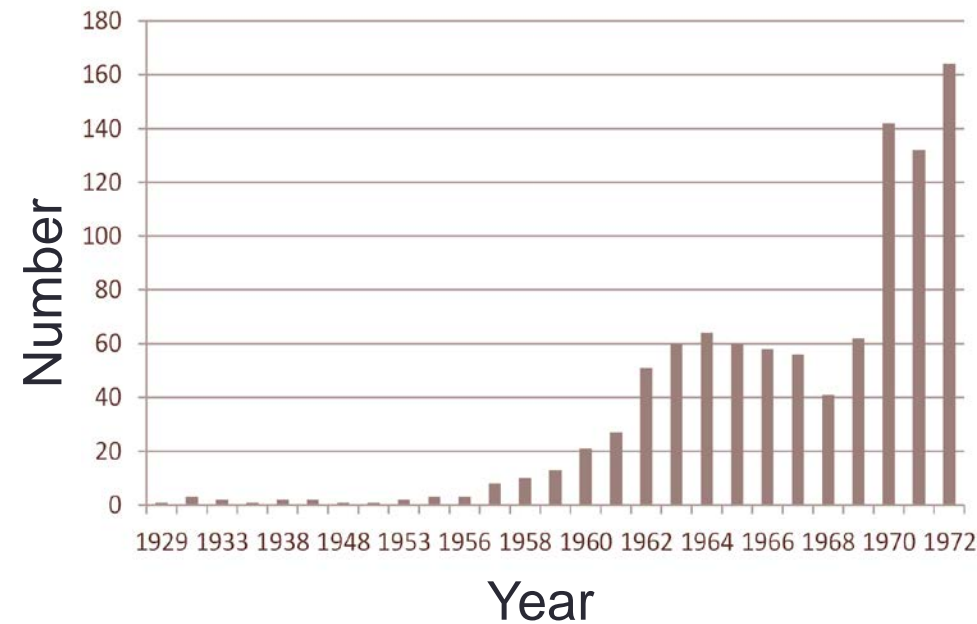
# History of major amendments of BSL (fire safety etc.)

Years	Amendments of BSL
1959	Definition of Fire resistive structure, Non-combustible material Fire compartmentation (floor area, different occupancy, penetration seal) Staircase specification for department store and hall
1961	Interior finish restriction (IFR) to Night club, Bar, etc.
1963	IFR to high-rise buildings (over 31m)
1964	Compartmentation and IFR above 11 story (500m <sup>2</sup> + Non-comb., 200m <sup>2</sup> + Quasi-non-comb.) Specific staircase (staircase with an ancillary room) in buildings with 15 story
1969	Restriction to Shaft, atrium, stairwell, through 3 story, common path of travel, automatic close fire doors, Specific staircase in basement, Compartment of underground shopping district
1970	Smoke exhaust equipment, smoke compartment, Emergency EV (over 31m), Rescue entry, Emergency lighting, Width of corridor in stores
1973	Fire doors with smoke barrier performance for stairwell, restriction of installation of 2 staircases
1981	Revised seismic design Fire damper in ducts on penetration, Definition of rooms with no room
1982	Smoke barrier in EV hall
1987	Scope of Fire resistive building and quasi-fireproof building
1992	Definition of quasi-fire resistive building
1993	Expanded the scope of quasi-fire resistive building
1994	Barrier free
2000	Implement of performance based codes
2005	Extension of buildings
2009	Approval of total renovation plan for existing building
2015	Inspection of fire doors, Relaxation of timber buildings and extension of buildings

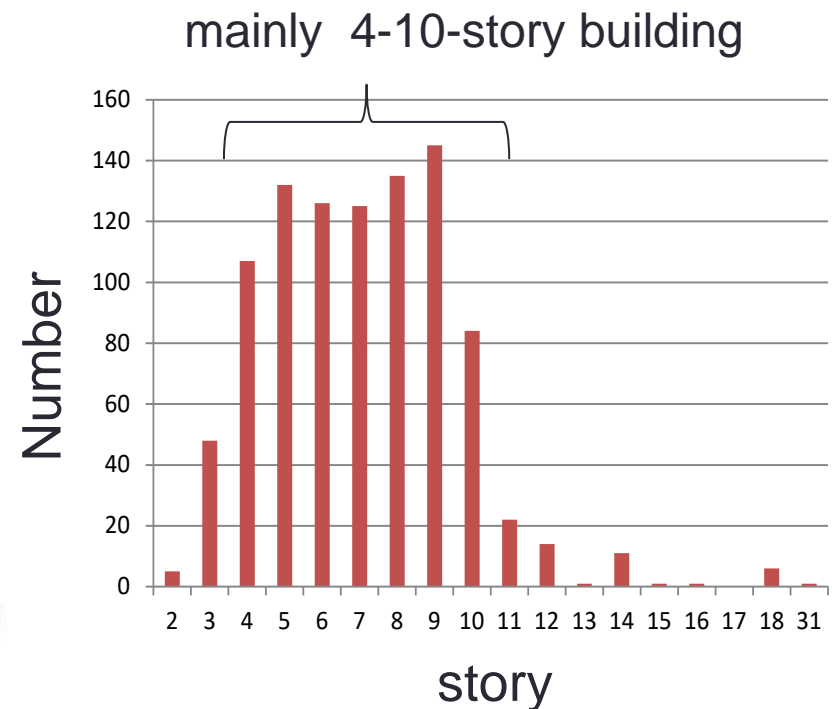


# Typical conflicts of existing buildings

- A survey of office buildings built before 1972
- The number of sample buildings was around 840.



Distribution of built year

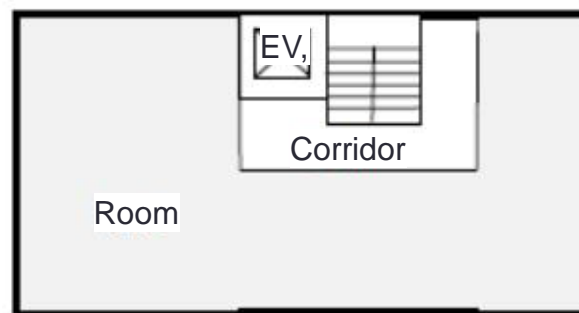
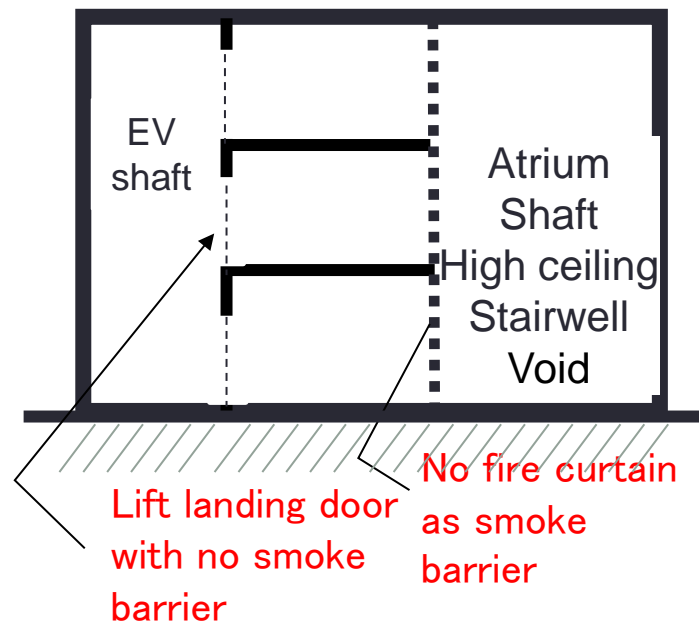


Distribution of floor number

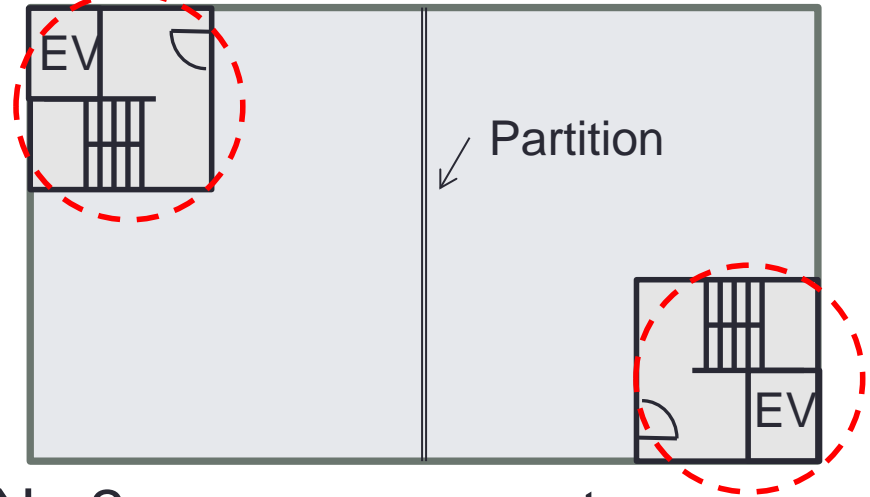
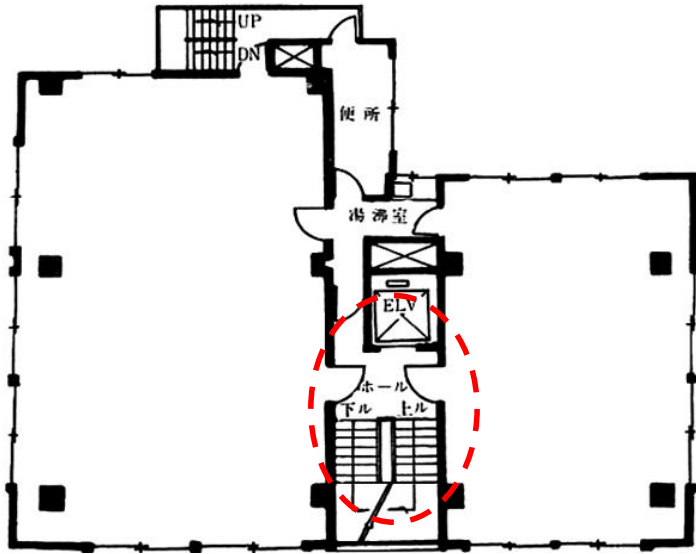
Building research Institute (Japan) conducted this survey in 2013.

# Typical conflicts of existing buildings

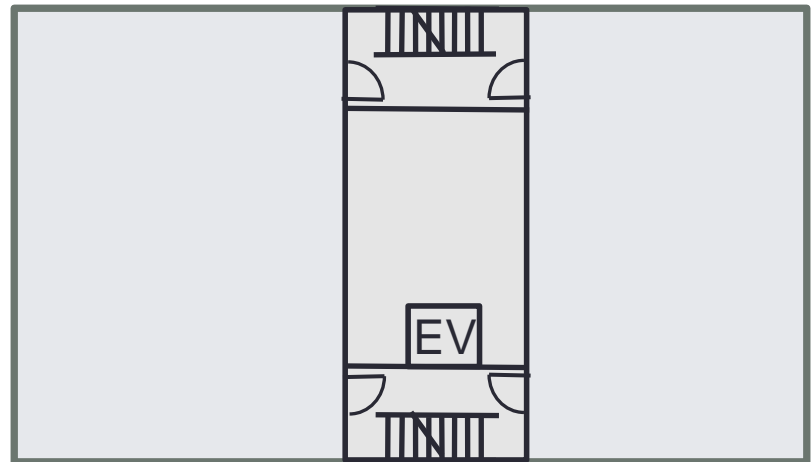
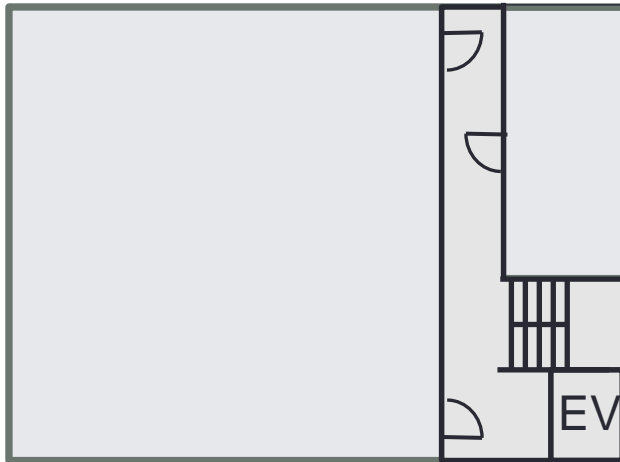
- **Requirement to Atrium, shaft, high ceiling, stair well, void (1969)**
  - Atrium, Staircase, EV hall, lobby and corridor etc. are not divided by fire doors, fire curtain, and so on.
  - Compartmentations are not clearly defined.
- **Requirement to installation of smoke exhaust equipment (1970)**
  - Difficulties
    - To add the equipment to buildings after completion, because of low ceiling height, floor height.
    - To exhaust smoke from rooms inside building, because of no window facing the outside
- **Requirement to common path to travel (1969)**
  - Length of overlap of egress routes  $\leq 1/2$  of egress route
- **Requirement to smoke barrier on EV hall (1982)**



# Typical conflicts of existing buildings

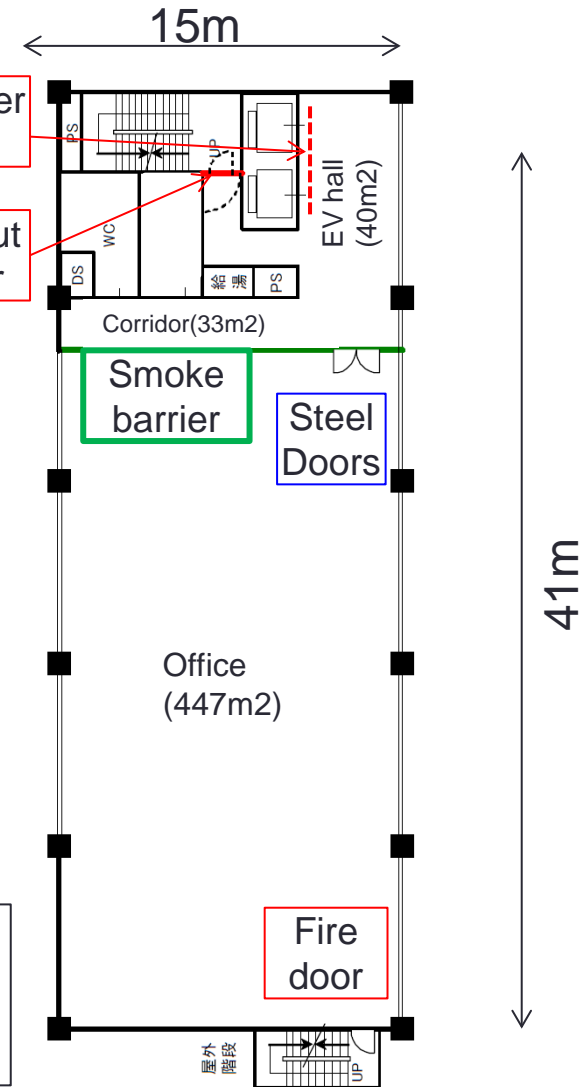


No 2-way egress route  
No compartmentation of staircase

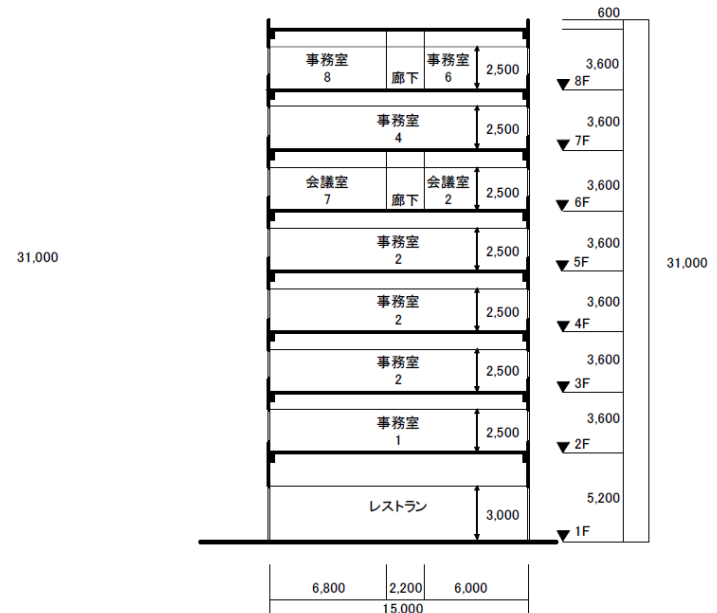
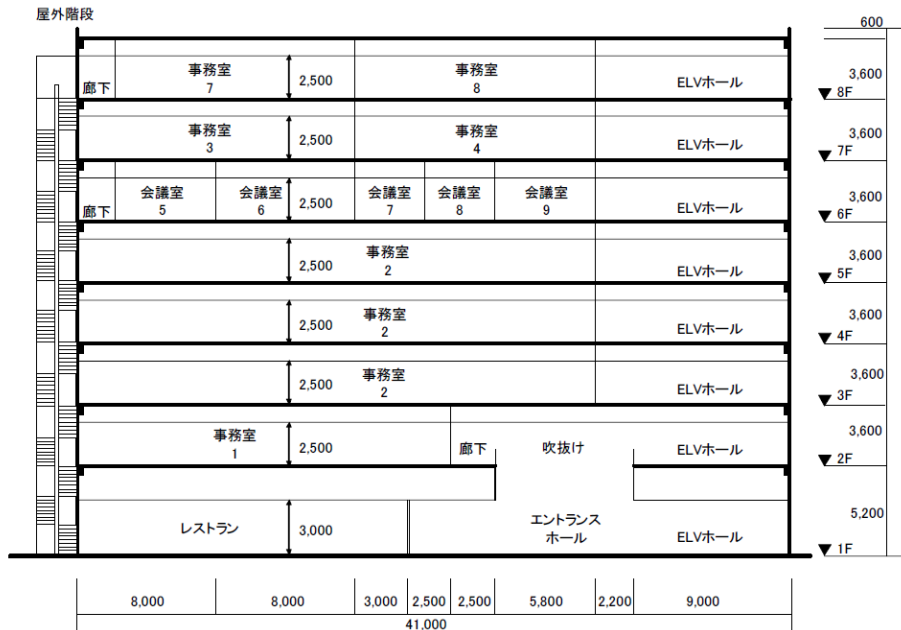
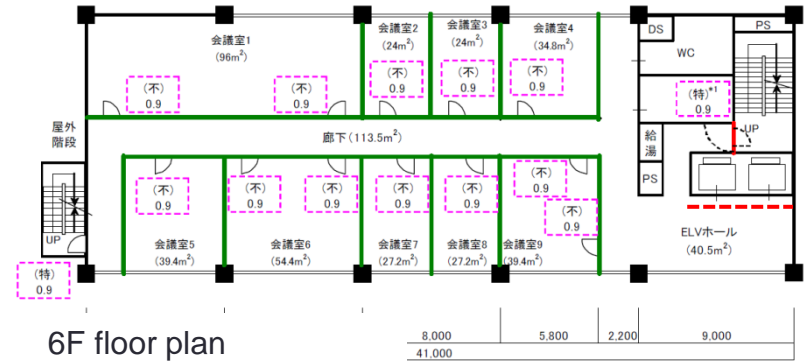
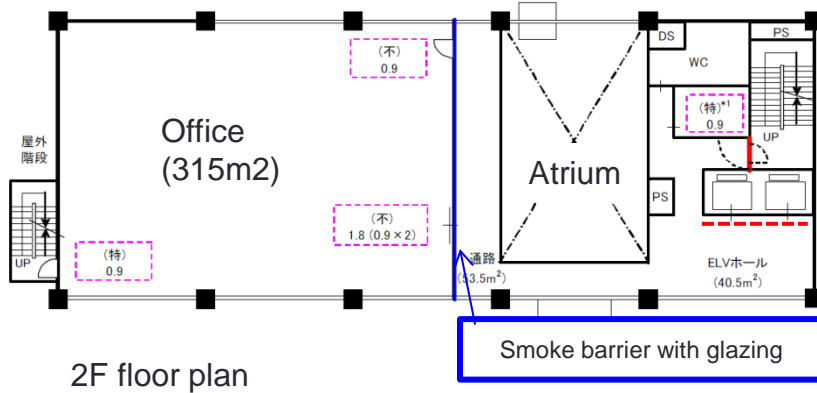


No compartmentation between staircase and corridor

- 
- UP



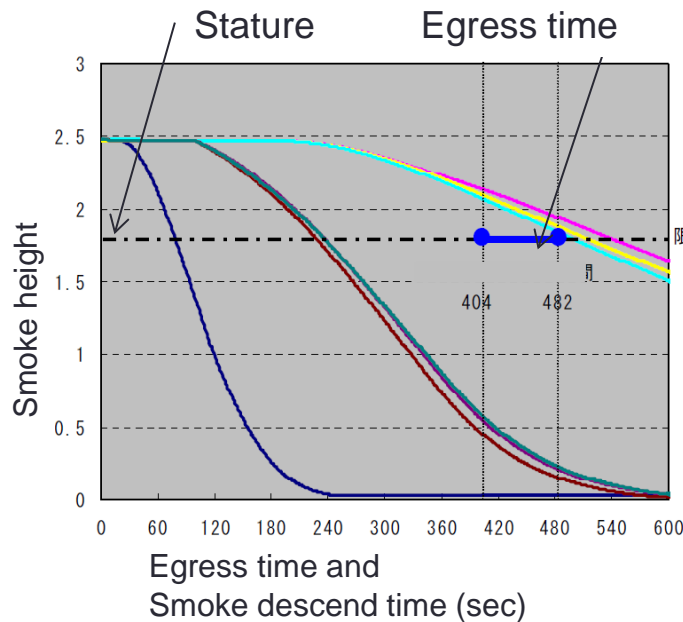
# Case studies of the evaluation for existing buildings by a performance-based method



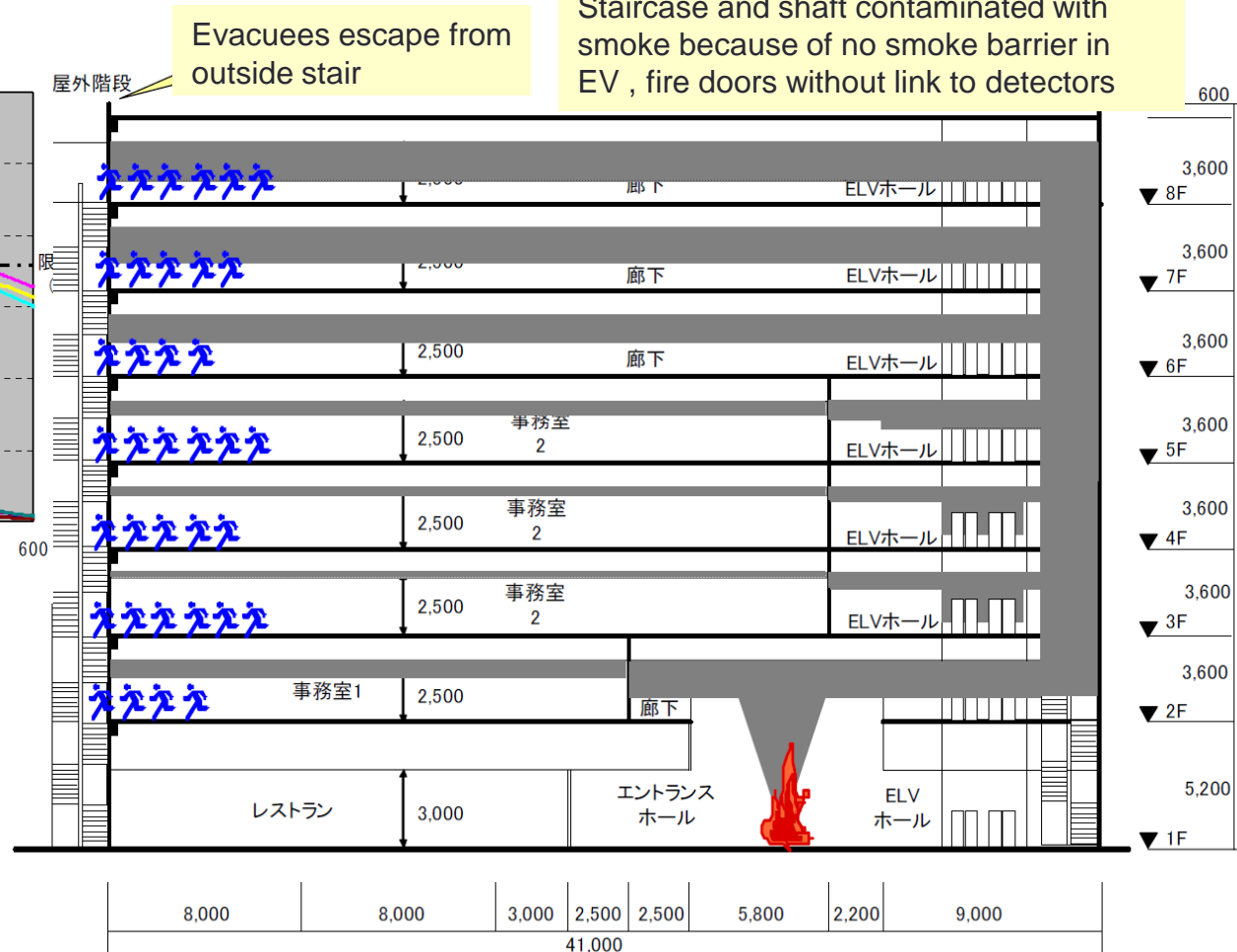
# Results of evaluation before taking measures

- A fire in the atrium in 1F

Staircase and shaft contaminated with smoke because of no smoke barrier in EV, fire doors without link to detectors



- 2F office
- 3F office
- 4F office
- 5F office
- 6F corridor
- 7F corridor
- 8F corridor



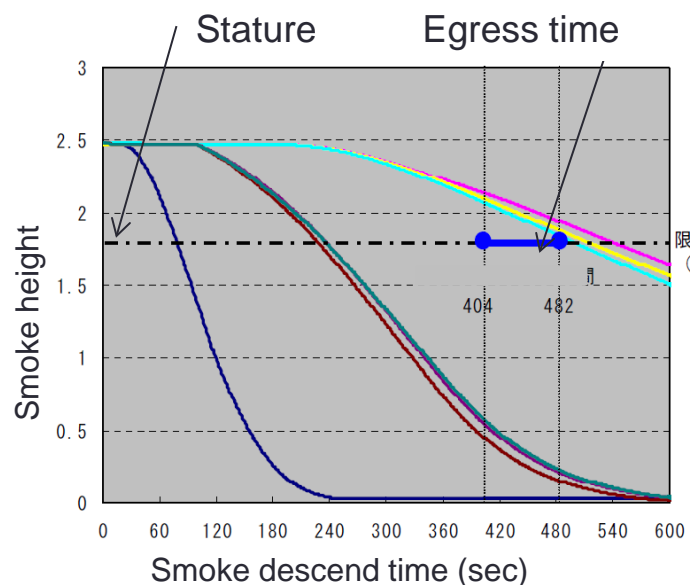
# Case studies of the evaluation for existing buildings by a performance-based method

- Evaluation of measures
  - Egress from fire room
    - Smoke chamber using space in ceiling
    - Increase in a width of exit doors of fire room
    - *Installation of smoke exhaust equipment( difficulties in practice)*
  - Egress from fire floor
    - Increase in smoke barrier performance of doors
    - *Installation of smoke exhaust equipment( difficulties in practice)*
  - Egress from building
    - ✓ **Increase in smoke barrier performance of lift landing doors**
    - ✓ **Installation of automatic closing fire doors linked to fire alarm**  
or fire doors kept close

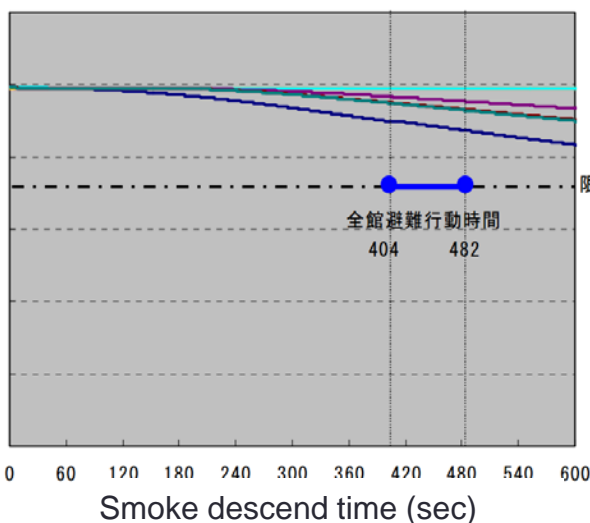
✓: measures to existing building.

# Results of evaluation before/after taking measures

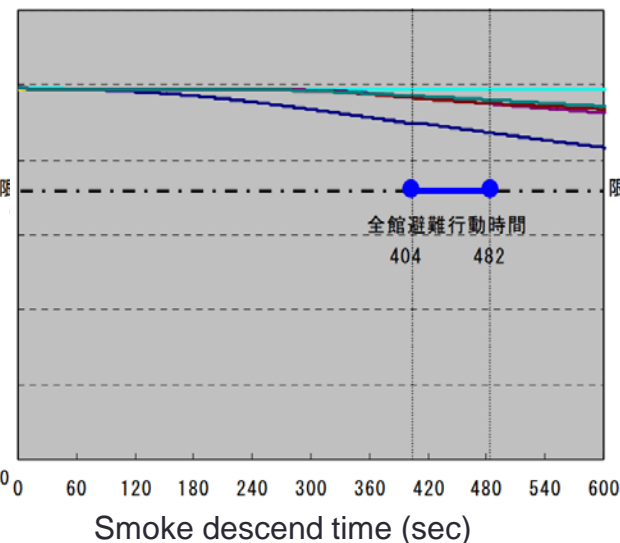
- Effect of the measures
- **A**: Installation of fire doors linked to smoke detectors
- **B**: Installation of **A** and smoke barrier on EV shaft



Existing building



Measures A



Measures B



# Ongoing projects for fire safety of existing buildings

- Promotive projects for building Standard provisions
- R&D of a method for improving fire safety performance of existing buildings (2016 , Fire safety project No.11)
  - Objective :
    - To promote adequate improvement and renovation of existing buildings  
Target : **Mid – high rise buildings**  
**Office, Department store, hotel, complex building**, etc.
  - Research contents:
    - A survey on **staircase and smoke exhaustion equipment** in existing buildings
    - Establishment of **step by step practical approach** to conform fire regulation in **Approval of total renovation plan for existing building**
      - **Total renovation plan: within 5years or 20years**
    - **Evaluation of fire prevention measure and control by occupant**